

(2) Sampling methods for IOC_s. Sample collection for antimony, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, nitrate, nitrite, selenium, and thallium under this subparagraph shall be conducted using the sample preservation, container, and maximum holding time procedures specified in the table below:

SAMPLING METHODS FOR IOC_s

Contaminant	Preservative ¹	Container ²	Time ³
Antimony	HNO ₃	P or G	6 months
Asbestos	4 degrees C	P or G	48 hours for filtration ⁵
Barium	HNO ₃	P or G	6 months
Beryllium	HNO ₃	P or G	6 months
Cadmium	HNO ₃	P or G	6 months
Chromium	HNO ₃	P or G	6 months
Cyanide	4 degrees C, NaOH	P or G	14 days
Fluoride	None	P or G	1 month
Mercury	HNO ₃	P or G	28 days
Nickel	HNO ₃	P or G	6 months
Nitrate ⁴	4 degrees C	P or G	48 hours
Nitrate-Nitrite ⁴	H ₂ SO ₄	P or G	28 days
Nitrite ⁴	4 degrees C	P or G	48 hours
Selenium	HNO ₃	P or G	6 months
Thallium	HNO ₃	P or G	6 months

¹ When indicated, samples must be acidified at the time of collection to pH < 2 with concentrated acid, or adjusted with sodium hydroxide to pH > 12. Samples collected for metals analysis may be preserved by acidification at the laboratory, using a 1:1 nitric acid solution (50 percent by volume), provided the shipping time and other instructions in Section 8.3 of EPA Methods 200.7, 200.8, and 200.9 are followed. When chilling is indicated, the sample must be shipped and stored at 4 degrees C or less.

² P: plastic, hard or soft; G: glass, hard or soft.

³ In all cases, samples should be analyzed as soon after collection as possible. Follow additional (if any) information on preservation, containers, or holding times that is specified in the method.

⁴ Nitrate may only be measured separate from nitrite in samples that have not been acidified. Measurement of acidified samples provides a total nitrate (sum of nitrate plus nitrite) concentration. Acidification of total nitrate (nitrate plus nitrite) samples must be done in the field at the time of sample collection.

⁵ Instructions for containers, preservation procedures, and holding times as specified in Method 100.2 must be adhered to for all compliance analyses, including those conducted with Method 100.1.

f. *Unregulated inorganic chemicals.*

ANALYTICAL METHODS FOR UNREGULATED INORGANIC CONTAMINANTS

Contaminant	EPA Contaminant Code	Methodology	EPA	ASTM ¹	SM ²
Sulfate	1055	Ion Chromatography	300.0 ³	D4327-91	4110
		Automated Methylthymol Blue	375.2 ³		4500-SO ₄ -F
		Gravimetric			4500-SO ₄ -C,D

The procedures shall be done in accordance with the documents listed below. The incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51, effective January 4, 1995. Contact the Safe Drinking Water Hotline at (800)426-4791 to obtain information about these documents. Documents may be inspected at EPA's Drinking Water Docket, 401 M Street SW, Washington, DC 20460 (telephone: (202)260-3027); or at the Office of the Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC.

¹ Annual Book of ASTM Standards, 1994, Vols. 11.01 and 11.02, American Society for Testing and Materials. Copies may be obtained from the American Society for Testing and Materials, 101 Barr Harbor Drive, West Conshohocken, PA 19428.

² 18th edition of Standard Methods for the Examination of Water and Wastewater, 1992, American Public Health Association. Copies may be obtained from the American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005.

³ "Methods for the Determination of Inorganic Substances in Environmental Samples," EPA-600/R-93-100, August 1993. Available at NTIS, PB94-121811.

41.3(2) *Other inorganic chemical contaminants.* Reserved.

567—41.4(455B) Lead, copper, and corrosivity.

41.4(1) *Lead, copper, and corrosivity regulation by the setting of a treatment technique requirement.* The lead and copper rules do not set an MCL, although this could be changed in the future. The rules set two enforceable action levels, which trigger tap monitoring, corrosion control, source water treatment, lead service line replacement, and public education if exceeded.

a. Applicability. Unless otherwise indicated, each of the provisions of this subrule applies to community water systems and nontransient noncommunity water systems (hereinafter referred to as “water systems” or “systems”).

b. Action levels.

(1) Lead action level. The lead action level is exceeded if the concentration of lead in more than 10 percent of tap water samples collected during any monitoring period conducted in accordance with 41.4(1) “c” is greater than 0.015 mg/L (i.e., if the “90th percentile” lead level is greater than 0.015 mg/L).

(2) Copper action level. The copper action level is exceeded if the concentration of copper in more than 10 percent of tap water samples collected during any monitoring period conducted in accordance with 41.4(1) “c” is greater than 1.3 mg/L (i.e., if the “90th percentile” copper level is greater than 1.3 mg/L).

(3) Calculation of 90th percentile. The 90th percentile lead and copper levels shall be computed as follows:

The results of all lead or copper samples taken during a monitoring period shall be placed in ascending order from the sample with the lowest concentration to the sample with the highest concentration. Each sampling result shall be assigned a number, ascending by single integers beginning with the number 1 for the sample with the lowest contaminant level. The number assigned to the sample with the highest contaminant level shall be equal to the total number of samples taken.

The number of samples taken during the monitoring period shall be multiplied by 0.9.

The contaminant concentration in the numbered sample yielded by this calculation is the 90th percentile contaminant level.

For water systems serving fewer than 100 people that collect five samples per monitoring period, the 90th percentile is computed by taking the average of the highest and second highest concentrations.

c. Lead and copper tap water monitoring requirements.

(1) Sample site selection.

1. General. Public water supply systems shall complete a materials evaluation of their distribution systems by the date indicated in 41.4(1) “c”(4) in order to identify a pool of sampling sites that meets the requirements of this subrule, and which is sufficiently large to ensure that the water system can collect the number of lead and copper tap samples required in 41.4(1) “c”(3). All sites from which first-draw samples are collected shall be selected from this pool of targeted sampling sites. Sampling sites may not include faucets that have point-of-use or point-of-entry treatment devices designed to remove inorganic contaminants.

2. Information sources. A public water supply system shall use the information on lead, copper and galvanized steel that it is required to collect under 41.4(1) “f” as part of its responsibility for the special monitoring for corrosivity characteristics when conducting a materials evaluation. When an evaluation of the information collected is insufficient to locate the requisite number of lead and copper sampling sites that meet the targeting criteria in 41.4(1) “c”(1), the water system shall review all plumbing codes, permits, and records in the files of the building department(s) which indicate the plumbing materials that are installed within publicly and privately owned structures connected to the distribution system; all inspections and records of the distribution system that indicate the material composition of the service connections that connect a structure to the distribution system; and all existing water quality information, which includes the results of all prior analyses of the system or individual structures connected to the system, indicating locations that may be particularly susceptible to high lead or copper concentrations. In addition, the system shall seek to collect such information where possible in the course of its normal operations (e.g., checking service line materials when reading water meters or performing maintenance activities).

3. Tier 1 community sampling sites. The sampling sites selected for a community water system's sampling pool ("tier 1 sampling sites") shall consist of single-family structures that contain copper pipes with lead solder installed after 1982 or contain lead pipes; or are served by a lead service line. When multiple-family residences comprise at least 20 percent of the structures served by a water system, the system may include these types of structures in its sampling pool.

4. Tier 2 community sampling sites. Any community water system with insufficient tier 1 sampling sites shall complete its sampling pool with "tier 2 sampling sites," consisting of buildings, including multiple-family residences that contain copper pipes with lead solder installed after 1982 or contain lead pipes; or are served by a lead service line.

5. Tier 3 community sampling sites. Any community water system with insufficient tier 1 and tier 2 sampling sites shall complete its sampling pool with "tier 3 sampling sites," consisting of single-family structures that contain copper pipes with lead solder installed before 1983.

6. Tier 1 NTNC sampling sites. The sampling sites selected for a nontransient noncommunity water system ("tier 1 sampling sites") shall consist of buildings that: contain copper pipes with lead solder installed after 1982 or contain lead pipes; or are served by a lead service line.

7. Other NTNC sampling sites. A nontransient noncommunity water system with insufficient tier 1 sites that meet the targeting criteria in 41.4(1)"c"(1)"6" shall complete its sampling pool with sampling sites that contain copper pipes with lead solder installed before 1983.

8. Reporting of sample site selection criteria. Any public water supply system whose sampling pool does not consist exclusively of tier 1 sites shall demonstrate in a letter submitted to the department why a review of the information listed in 41.4(1)"c"(1)"2" was inadequate to locate a sufficient number of tier 1 sites. Any community water system which includes tier 3 sampling sites in its sampling pool shall demonstrate in such a letter why it was unable to locate a sufficient number of tier 1 and tier 2 sampling sites. Any public water supply system whose distribution system contains lead service lines shall draw 50 percent of the samples it collects during each monitoring period from sites that contain lead pipes, or copper pipes with lead solder, and 50 percent of those samples from sites served by a lead service line. A water system that cannot identify a sufficient number of sampling sites served by a lead service line shall demonstrate in a letter to the department why the system was unable to locate a sufficient number of such sites. Such a water system shall collect first-draw samples from all of the sites identified as being served by such lines.

(2) Sample collection methods.

1. Tap samples for lead and copper collected in accordance with this subparagraph, with the exception of lead service line samples collected under 567—subrule 43.7(4), shall be first-draw samples.

2. First-draw tap samples for lead and copper shall be one liter in volume and have stood motionless in the plumbing system of each sampling site for at least six hours. First-draw samples from residential housing shall be collected from the cold-water kitchen tap or bathroom sink tap. First-draw samples from a nonresidential building shall be collected at an interior tap from which water is typically drawn for consumption. First-draw samples may be collected by the system or the system may allow residents to collect first-draw samples after instructing the residents of the sampling procedures specified in this paragraph. To avoid problems of residents handling nitric acid, acidification of first-draw samples may be done up to 14 days after the sample is collected. If the sample is not acidified immediately after collection, then the sample must stand in the original container for at least 28 hours after acidification. If a system allows residents to perform sampling, the system may not challenge, based on alleged errors in sample collection, the accuracy of sampling results.

3. Service line samples collected to determine if the service line is directly contributing lead (as described in 567—subrule 43.7(4)) shall be one liter in volume and have stood motionless in the lead service line for at least six hours and be collected at the tap after flushing the volume of water between the tap and the lead service line. The volume of water shall be calculated based on the interior diameter and length of the pipe between the tap and the lead service line; tapping directly into the lead service line; or if the sampling site is a building constructed as a single-family residence, allowing the water to run until there is a significant change in temperature which would be indicative of water that has been standing in the lead service line.

4. A public water supply system shall collect each first-draw tap sample from the same sampling site from which it collected a previous sample. If, for any reason, the water system cannot gain entry to a sampling site in order to collect a follow-up tap sample, the system may collect the follow-up tap sample from another sampling site in its sampling pool as long as the new site meets the same targeting criteria, and is within reasonable proximity of the original site.

(3) Number of samples. Water systems shall collect at least one sample during each monitoring period specified in 41.4(1)“c”(4) from the number of sites as listed in the column below titled “standard monitoring.” A system conducting reduced monitoring under 41.4(1)“c”(4) may collect one sample from the number of sites specified in the column titled “reduced monitoring” during each monitoring period specified in 41.4(1)“c”(4).

REQUIRED NUMBER OF LEAD/COPPER SAMPLES

System Size (Number of People Served)	Standard Monitoring (Number of Sites)	Reduced Monitoring (Number of Sites)
greater than 100,000	100	50
10,001 to 100,000	60	30
3,301 to 10,000	40	20
501 to 3,300	20	10
101 to 500	10	5
less than or equal to 100	5	5

(4) Timing of monitoring.

1. Initial tap sampling. The first six-month monitoring period for small, medium-size and large systems shall begin on the following dates:

System Size (Number of People Served)	First Six-month Monitoring Period Begins on:
greater than 50,000 (large system)	January 1, 1992
3,301 to 50,000 (medium system)	July 1, 1992
less than or equal to 3,300 (small system)	July 1, 1993

All large systems shall monitor during two consecutive six-month periods. All small and medium-size systems shall monitor during each six-month monitoring period until the system exceeds the lead or copper action level and is, therefore, required to implement the corrosion control treatment requirements under 567—paragraph 43.7(1)“a,” in which case the system shall continue monitoring in accordance with 41.4(1)“c”(4), or the system meets the lead and copper action levels during two consecutive six-month monitoring periods, in which case the system may reduce monitoring in accordance with 41.4(1)“c”(4).

2. Monitoring after installation of corrosion control and source water treatment. Large systems which install optimal corrosion control treatment pursuant to 567—subparagraph 43.7(1)“d”(4) shall monitor during two consecutive six-month monitoring periods by the date specified in 567—subparagraph 43.7(1)“d”(5). Small or medium-size systems which install optimal corrosion control treatment pursuant to 567—subparagraph 43.7(1)“e”(5) shall monitor during two consecutive six-month monitoring periods as specified in 567—subparagraph 43.7(1)“e”(6). Systems which install source water treatment shall monitor during two consecutive six-month monitoring periods by the date specified in 567—subparagraph 43.7(3)“a”(4).

3. Monitoring after the department specifies water quality parameter values for optimal corrosion control. After the department specifies the values for water quality control parameters under 567—paragraph 43.7(2)“f,” the system shall monitor during each subsequent six-month monitoring period, with the first monitoring period to begin on the date the department specifies the optimal values under 567—paragraph 43.7(2)“f.”

4. Reduced monitoring.

- A small or medium-size water system that meets the lead and copper action levels during each of two consecutive six-month monitoring periods may reduce the number of samples according to 41.4(1)“c”(3) and reduce the frequency of sampling to once per year.

- Any public water supply system that maintains the range of values for the water quality control parameters reflecting optimal corrosion control treatment specified by the department under 567—paragraph 43.7(2)“f” during each of two consecutive six-month monitoring periods may request that the system be allowed to reduce the monitoring frequency to once per year and to reduce the number of lead and copper samples according to 41.4(1)“c”(3). The department will review the information submitted by the water system and shall set forth the basis for its determination in writing. Where appropriate, the department will revise its determination when the system submits new monitoring or treatment data, or when other data relevant to the number and frequency of tap sampling becomes available.

- A small or medium-size water system that meets the lead and copper action levels during three consecutive years of monitoring may reduce the frequency of monitoring for lead and copper from annually to once every three years. Any water system that maintains the range of values for the water quality control parameters reflecting optimal corrosion control treatment specified by the department under 567—paragraph 43.7(2)“f” during three consecutive years of monitoring may request the department to allow the system to reduce the frequency of monitoring from annually to once every three years. The department shall review the information submitted by the system and shall set forth the basis for its determination in writing. Where appropriate, the department will revise its determination when the system submits new monitoring or treatment data, or when other data relevant to the number and frequency of tap sampling becomes available.

- A water system that reduces the number and frequency of sampling shall collect these samples from sites included in the pool of targeted sampling sites identified in 41.4(1)“c”(1). Systems sampling annually or less frequently shall conduct the lead and copper tap sampling during the months of June, July, August or September.

- A small or medium-size water system subject to reduced monitoring that exceeds the lead or copper action level shall resume sampling according to 41.4(1)“c”(4)“3” and collect the number of samples specified for standard monitoring in 41.4(1)“c”(3). Such systems shall also conduct water quality parameter monitoring in accordance with 41.4(1)“d”(2), (3), or (4), as appropriate, during the monitoring period in which it exceeded the action level. Any water system subject to reduced monitoring frequency that fails to operate within the range of values for the water quality control parameters specified by the department under 567—paragraph 43.7(2)“f” shall resume tap water sampling according to 41.4(1)“c”(4)“3” and collect the number of samples specified for standard monitoring in 41.4(1)“c”(3).

- Additional monitoring by systems. The results of any monitoring conducted in addition to the minimum requirements of 41.4(1)“c” shall be considered by the system and the department in making any determinations (i.e., calculating the 90th percentile lead or copper level) under this subrule.

d. Water quality parameter monitoring requirements. All large public water supply systems (and all small and medium-size public water supply systems that exceed the lead or copper action level) shall monitor water quality parameters in addition to lead and copper in accordance with this subrule. The requirements of this subrule are summarized in the table at the end of 41.4(1)“d”(6). The water quality parameters must be reported in accordance with the monthly operation report requirements listed in 567—subrule 42.4(3).

(1) General requirements.

1. Sample collection methods. Tap samples shall be representative of water quality throughout the distribution system taking into account the number of persons served, the different sources of water, the different treatment methods employed by the system, and seasonal variability. Tap sampling under this subrule is not required to be conducted at taps targeted for lead and copper sampling under 41.4(1)“c”(1)“1.” Systems may conduct tap sampling for water quality parameters at sites used for coliform sampling. Samples collected at the entry point(s) to the distribution system shall be from locations representative of each source after treatment. If a system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions (i.e., when water is representative of all sources being used).

2. Number of samples. Systems shall collect two samples for each applicable water quality parameter at each entry point to the distribution system during each six-month monitoring period specified in 41.4(1)“d”(2). During each monitoring period specified in 41.4(1)“d”(3) through (5), systems shall collect one sample for each applicable water quality parameter at each entry point to the distribution system. Systems shall collect two tap samples for applicable water quality parameters during each six-month monitoring period specified in 41.4(1)“d”(2) through (5) from the following number of sites.

REQUIRED NUMBER OF SAMPLES: WATER QUALITY PARAMETERS

System Size (Number of People Served)	Number of Sites for Water Quality Parameters
greater than 100,000	25
10,001 to 100,000	10
3,301 to 10,000	3
501 to 3,300	2
101 to 500	1
less than or equal to 100	1

(2) Initial sampling. Large water systems shall measure the applicable water quality parameters as specified below at taps and at each entry point to the distribution system during each six-month monitoring period specified in 41.4(1)“c”(4)“1.” Small and medium-size systems shall measure the applicable water quality parameters at taps and at each entry point to the distribution system during each six-month monitoring period specified in 41.4(1)“c”(4)“1” during which the system exceeds the lead or copper action level. Tap water and entry point monitoring shall include: pH; alkalinity; orthophosphate, when an inhibitor containing a phosphate compound is used; silica, when an inhibitor containing a silicate compound is used; calcium; conductivity; and water temperature.

(3) Monitoring after installation of corrosion control. Large systems which install optimal corrosion control treatment pursuant to 567—subparagraph 43.7(1)“d”(4) shall measure the water quality parameters at the locations and frequencies specified below during each six-month monitoring period specified in 41.4(1)“c”(4)“2.” Small or medium-size systems which install optimal corrosion control treatment shall conduct such monitoring during each six-month monitoring period specified in 41.4(1)“c”(4)“2” in which the system exceeds the lead or copper action level.

1. Tap water monitoring shall include two samples for: pH; alkalinity; orthophosphate, when an inhibitor containing a phosphate compound is used; silica, when an inhibitor containing a silicate compound is used; calcium, when calcium carbonate stabilization is used as part of corrosion control.

2. Monitoring at each entry point to the distribution system shall include one sample every two weeks (biweekly) for: pH; a reading of the dosage rate of the chemical used to adjust alkalinity, and the alkalinity concentration when alkalinity is adjusted as part of optimal corrosion control; and a reading of the dosage rate of the inhibitor used, and the concentration of orthophosphate or silica (whichever is applicable) when a corrosion inhibitor is used as part of optimal corrosion control.

(4) Monitoring after the department specifies water quality parameter values for optimal corrosion control. After the department specifies the values for applicable water quality control parameters reflecting optimal corrosion control treatment, large systems shall measure the applicable water quality parameters according to 41.4(1)“d”(3) during each monitoring period specified in 41.4(1)“c”(4)“3.” Any small or medium-size system shall conduct such monitoring during each monitoring period specified in 41.4(1)“c”(4)“3” in which the system exceeds the lead or copper action level. The system may take a confirmation sample for any water quality parameter value no later than three days after the first sample. If a confirmation sample is taken, the result must be averaged with the first sampling result and the average must be used for any compliance determinations. The department may disregard results of obvious sampling errors from this calculation.

(5) Reduced monitoring.

1. Public water supply systems that maintain the range of values for the water quality parameters reflecting optimal corrosion control treatment during each of two consecutive six-month monitoring periods under 41.4(1)“c”(4) shall continue monitoring at the entry point(s) to the distribution system as specified in 567—paragraph 43.7(2)“f.” Such system may collect two tap samples for applicable water quality parameters from the following reduced number of sites during each six-month monitoring period.

REDUCED WATER QUALITY PARAMETER MONITORING

System Size (Number of People Served)	Reduced Number of Sites for Water Quality Parameters
greater than 100,000	10
10,001 to 100,000	7
3,301 to 10,000	3
501 to 3,300	2
101 to 500	1
less than or equal to 100	1

2. Public water systems that maintain the range of values for the water quality parameters reflecting optimal corrosion control treatment specified by the department under 567—paragraph 43.7(2)“f” during three consecutive years of annual monitoring under this paragraph may reduce the frequency with which it collects the number of tap samples for applicable water quality parameters specified in 41.4(1)“d”(5) from annually to every three years.

3. A public water system that conducts sampling annually shall collect these samples evenly throughout the year so as to reflect seasonal variability.

4. Public water systems subject to reduced monitoring frequency that fail to operate within the range of values for the water quality parameters specified by the department under 567—paragraph 43.7(2)“f” shall resume tap water sampling in accordance with the number and frequency requirements in 41.4(1)“d”(3).

(6) Additional monitoring by systems. The results of any monitoring conducted in addition to the minimum requirements of this subrule shall be considered in making any determinations (i.e., determining concentrations of water quality parameters) under this subrule or 567—subrule 43.7(2).

SUMMARY OF MONITORING REQUIREMENTS FOR WATER QUALITY PARAMETERS¹

Monitoring Period	Location	Parameters ²	Frequency
Initial Monitoring	Taps and at entry point(s) to distribution systems	pH, alkalinity, orthophosphate or silica ³ , calcium, conductivity, temperature	Every 6 months
After Installation of Corrosion Control	Taps	pH, alkalinity, orthophosphate, silica ³ , calcium ⁴	Every 6 months
	Entry point(s) to distribution system	pH, alkalinity dosage rate and concentration (if alkalinity adjusted as part of corrosion control), inhibitor dosage rate and inhibitor residual ⁵	Biweekly
After State Specifies Parameter Values for Optimal Corrosion Control	Taps	pH, alkalinity, orthophosphate, silica ³ , calcium ⁴	Every 6 months
	Entry point(s) to distribution system	pH, alkalinity, dosage rate and concentration (if alkalinity adjusted as part of corrosion control), inhibitor dosage rate and inhibitor residual ⁵	Biweekly
Reduced Monitoring	Taps	pH, alkalinity, orthophosphate or silica ³ , calcium ⁴	Every 6 months at a reduced number of sites
	Entry point(s) to distribution system	pH, alkalinity rate and concentration (if alkalinity adjusted as part of corrosion control), inhibitor dosage rate and inhibitor residual ⁵	Biweekly

¹ Table is for illustrative purposes; consult the text of this subrule for precise regulatory requirements.
² Small and medium-size systems have to monitor for water quality parameters only during monitoring periods in which the system exceeds the lead or copper action level.
³ Orthophosphate must be measured only when an inhibitor containing a phosphate compound is used. Silica must be measured only when an inhibitor containing silicate compound is used.
⁴ Calcium must be measured only when calcium carbonate stabilization is used as part of corrosion control.
⁵ Inhibitor dosage rates and inhibitor residual concentrations (orthophosphate or silica) must be measured only when an inhibitor is used.

e. Lead and copper source water monitoring requirements.

(1) Sample location, collection methods, and number of samples.

1. A water system that fails to meet the lead or copper action level on the basis of tap samples collected in accordance with 41.4(1) “c” shall collect lead and copper source water samples in accordance with the requirements regarding sample location, number of samples, and collection methods specified for inorganic chemical sampling. The timing of sampling for lead and copper shall be in accordance with 41.4(1) “e”(2) and (3).

2. Where the results of sampling indicate an exceedance of maximum permissible source water levels established under 567—subparagraph 43.7(3) “b”(4), the department may require that one additional sample be collected as soon as possible after the initial sample was taken (but not to exceed two weeks) at the same sampling point. If a confirmation sample is taken for lead or copper, then the results of the initial and confirmation samples shall be averaged in determining compliance with the maximum permissible levels. Lead and copper analytical results below the detection limit shall be considered to be zero. Analytical results above the detection limit but below the practical quantification level (PQL) shall either be considered as the measured value or be considered one-half the PQL.

(2) Monitoring after system exceeds tap water action level. Any system which exceeds the lead or copper action level at the tap shall collect one source water sample from each entry point to the distribution system within six months after the exceedance.

(3) Monitoring after installation of source water treatment. Any system which installs source water treatment pursuant to 567—subparagraph 43.7(3) “a”(3) shall collect an additional source water sample from each entry point to the distribution system during two consecutive six-month monitoring periods by the deadline specified.

(4) Monitoring frequency after the department specifies maximum permissible source water levels or determines that source water treatment is not needed.

1. A system shall monitor at the frequency specified below in cases where the department specifies maximum permissible source water levels under 567—subparagraph 43.7(3) “b”(4) or determines that the system is not required to install source water treatment under 567—subparagraph 43.7(3) “b”(2). A water system using only groundwater shall collect samples once during the three-year compliance period in effect when the department makes this determination. Such systems shall collect samples once during each subsequent compliance period. A public water system using surface water (or a combination of surface and groundwater) shall collect samples once during each year, the first annual monitoring period to begin on the date on which the department makes this determination.

2. A system using only groundwater is not required to conduct source water sampling for lead or copper if the system meets the action level for the specific contaminant in tap water samples during the entire source water sampling.

(5) Reduced monitoring frequency.

1. A water system using only groundwater which demonstrates that finished drinking water entering the distribution system has been maintained below the maximum permissible lead or copper concentrations specified by the department in 567—subparagraph 43.7(3) “b”(4) during at least three consecutive compliance periods under 41.4(1) “e”(4) “1” may reduce the monitoring frequency for lead or copper to once during each nine-year compliance cycle as defined in 567—40.2(455B).

2. A water system using surface water (or a combination of surface and groundwaters) which demonstrates that finished drinking water entering the distribution system has been maintained below the maximum permissible lead and copper concentrations specified by the department in 567—subparagraph 43.7(3) “b”(4) for at least three consecutive years may reduce the monitoring frequency in 41.4(1) “e”(4) “1” to once during each nine-year compliance cycle.

3. A water system that uses a new source of water is not eligible for reduced monitoring for lead or copper until concentrations in samples collected from the new source during three consecutive monitoring periods are below the maximum permissible lead and copper concentrations specified.

f. Corrosivity monitoring protocol—special monitoring for corrosivity characteristics. Suppliers of water for community public water systems shall collect samples from a representative entry point to the water distribution system for the purpose of analysis to determine the corrosivity characteristics of the water. The determination of corrosivity characteristics of water shall only include one round of sampling, except in cases where the department concludes additional monitoring is necessary due to variability of the raw water sources. Sampling requirements and approved analytical methods are as follows:

(1) Surface water systems. Systems utilizing a surface water source either in whole or in part shall collect two samples per plant for the purpose of determining the corrosivity characteristics. One of these samples is to be collected during the midwinter months and the other during midsummer.

(2) Groundwater systems. Systems utilizing groundwater sources shall collect one sample per plant or source, except systems with multiple plants that do not alter the corrosivity characteristics identified in 41.4(1) “f”(3) or systems served by multiple wells drawing raw water from a single aquifer may, with departmental approval, be considered one treatment plant or source when determining the number of samples required.

(3) Corrosivity characteristics analytical parameters. Determination of corrosivity characteristics of water shall include measurements of pH, calcium hardness, alkalinity, temperature, total dissolved solids (total filterable residue), and calculation of the Langelier Index. In addition, sulfate and chloride monitoring may be required by the department. At the department’s discretion, the Aggressiveness Index test may be substituted for the Langelier Index test.

(4) Corrosivity indices methodology. The following methods must be used to calculate the corrosivity indices:

- 1. Aggressiveness Index—“ANSI/AWWA C401-93: AWWA Standard for the Selection of Asbestos Cement Pressure Pipe, 4”–16” for Water Distribution Systems,” American Water Works Association, Denver, CO.
- 2. Langelier Index—“Standard Methods for the Examination of Water and Wastewater,” 14th edition, American Public Health Association, 1015 15th Street NW, Washington, DC 20005 (1975), Method 203, pp. 61-63.

(5) Distribution system construction materials. Community and nontransient noncommunity water supply systems shall identify whether the following construction materials are present in their distribution system and report to the department:

- 1. Lead from piping, solder, caulking, interior lining of distribution mains, alloys, and home plumbing.
- 2. Copper from piping and alloys, service lines, and home plumbing.
- 3. Galvanized piping, service lines, and home plumbing.
- 4. Ferrous piping materials such as cast iron and steel.
- 5. Asbestos cement pipe.
- 6. Vinyl lined asbestos cement pipe.
- 7. Coal tar lined pipes and tanks.
- 8. Pipe with asbestos cement lining.
- g. Lead, copper, and water quality parameter analytical methods.

(1) Analytical methods. Analyses for alkalinity, calcium, conductivity, orthophosphate, pH, silica, and temperature may be performed by a Grade I, II, III, or IV certified operator meeting the requirements of 567—Chapter 81, any person under the supervision of a Grade I, II, III, or IV certified operator meeting the requirements of 567—Chapter 81, or a laboratory certified by the department to perform analysis under 567—Chapter 83. Analyses under this subrule for lead and copper shall only be conducted by laboratories that have been certified by the department, pursuant to 567—Chapter 83. The following methods must be used:

LEAD, COPPER AND WATER QUALITY PARAMETER ANALYTICAL METHODS

Contaminant	EPA Contaminant Code	Methodology ⁹	Reference (Method Number)			
			EPA	ASTM ³	SM ⁴	USGS ⁵
Alkalinity	1927	Titrimetric Electrometric titration		D1067-92B	2320 B	I-1030-85
Calcium	1919	EDTA titrimetric Atomic absorption; direct aspiration Inductively-coupled plasma	200.7 ²	D511-93A D511-93B	3500-Ca D 3111 B 3120 B	
Chloride	1017	Ion chromatography Potentiometric titration	300.0 ⁸	D4327-91	4110B 4500-Cl-D	
Conductivity	1064	Conductance		D1125-95A	2510 B	

Contaminant	EPA Contaminant Code	Methodology ⁹	Reference (Method Number)			
			EPA	ASTM ³	SM ⁴	USGS ⁵
Copper ⁶	1022	Atomic absorption; furnace technique		D1688-95C	3113 B	
		Atomic absorption; direct aspiration		D1688-95A	3111 B	
		Inductively-coupled plasma	200.7 ²		3120 B	
		Inductively-coupled plasma; mass spectrometry	200.8 ²			
Lead ⁶	1030	Atomic absorption; platform furnace	200.9 ²			
		Atomic absorption; furnace technique		D3559-95D	3113 B	
		Inductively-coupled plasma; mass spectrometry	200.8 ²			
		Atomic absorption; platform furnace technique	200.9 ²			
pH	1925	Differential pulse anodic stripping voltammetry				Method 1001 ¹⁰
		Electrometric	150.1 ¹	D1293-95	4500-H+ B	
			150.2 ¹			
Orthophosphate (Unfiltered no digestion or hydrolysis)	1044	Colorimetric, automated, ascorbic acid	365.1 ⁸		4500-P F	
		Colorimetric, ascorbic acid, single reagent		D515-88A	4500-P E	
		Colorimetric, phosphomolybdate;				I-1602-85
		Automated-segmented flow				I-2601-90 ⁸
Silica	1049	Automated discrete				I-2598-85
		Ion chromatography	300.0 ⁷	D4327-91	4110 B	
		Colorimetric, molybdate blue				I-1700-85
		Automated-segmented flow				I-2700-85
Temperature	1996	Colorimetric		D859-95		
		Molybdosilicate			4500-Si D	
		Heteropoly blue			4500-Si E	
		Automated method for molybdate-reactive silica			4500-Si F	
Total Filterable Residue (TDS)	1930	Inductively-coupled plasma ⁶	200.7 ²		3120 B	
		Thermometric			2550 B	
		Gravimetric			2540 C	

The procedures shall be done in accordance with the documents listed below. The incorporation by reference of the following documents was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51, effective January 4, 1995. Copies of the documents may be obtained from the sources listed below. Contact the Safe Drinking Water Hotline at (800)426-4791 to obtain information about these documents. Documents may be inspected at EPA's Drinking Water Docket, 401 M Street, SW, Washington, DC 20460 (telephone: (202)260-3027); or at the Office of Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC.

¹ "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020, March 1983. Available at NTIS as PB84-128677. Also available at US EPA, EMSL, Cincinnati, OH.

² "Methods for the Determination of Metals in Environmental Samples," EPA-600/4-91-010, June 1991. Available at NTIS as PB91-231498.

³ Annual Book of ASTM Standards, 1994 and 1996, Vols. 11.01 and 11.02, American Society for Testing and Materials. The previous versions of D1688-95A and D1688-95C (copper), D3559-95 (lead), D1293-95 (pH), D1125-91A (conductivity), and D859-94 (silica) are also approved. These previous versions, D1688-90A, C, D3559-90D, D1293-84, D1125-91A and D859-88, respectively, are located in the Annual Book of ASTM Standards, 1994, Volume 11.01. Copies may be obtained from the American Society for Testing and Materials, 101 Barr Harbor Drive, West Conshohocken, PA 19428.

⁴ 18th and 19th editions of Standard Methods for the Examination of Water and Wastewater, 1992 and 1995, respectively, American Public Health Association. Copies may be obtained from the American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005.

⁵ Techniques of Water Resources Investigation of the U.S. Geological Survey, Book 5, Chapter A-1, 3rd ed., 1989. Available from Information Services, U.S. Geological Survey, Federal Center, Box 25286, Denver, CO 80225-0425.

⁶ Samples may not be filtered. Samples that contain less than 1 NTU (Nephelometric turbidity unit) and are properly preserved (concentrated nitric acid to pH < 2) may be analyzed directly (without digestion) for total metals; otherwise, digestion is required. When digestion is required, the total recoverable technique as defined in the method must be used.

⁷ "Methods for the Determination of Inorganic Substances in Environmental Samples," EPA/600/R-93/100, August 1993. Available at NTIS as PB94-120821.

⁸ "Methods of Analysis by the U.S. Geological Survey National Water Quality Laboratory—Determination of Inorganic and Organic Constituents in Water and Fluvial Sediments, Open File Report 93-125." Available at Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

⁹ Because MDLs reported in EPA Methods 200.7 and 200.9 were determined using a 2X preconcentration step during sample digestion, MDLs determined when samples are analyzed by direct analysis (i.e., no sample digestion) will be higher. Preconcentration may be required for direct analysis of lead by Methods 200.9, 3113B, and 3559-90D unless multiple in-furnace depositions are made.

¹⁰ The description for Method 1001 is available from Palintest, Ltd., 21 Kenton Lands Road, P.O. Box 18395, Erlanger, KY 41018; or from the Hach Company, P.O. Box 389, Loveland, CO.

(2) Certified laboratory requirements. Lead and copper analyses under this subrule shall only be conducted by laboratories that have been certified by the department and are in compliance with the requirements of 567—Chapter 83.

(3) All lead and copper levels measured between the practical quantitation limit (PQL) and method detection limit (MDL) must be either reported as measured or they can be reported as one-half the PQL specified for lead and copper in 41.4(1) "g"(2) "2." All levels below the lead and copper MDLs must be reported as zero.

41.4(2) *Lead, copper, and corrosivity regulation by the setting of an MCL.* Reserved.

567—41.5(455B) Organic chemicals.

41.5(1) *MCLs and other requirements for organic chemicals.* Maximum contaminant levels for three classes of organic chemical contaminants specified in 41.5(1) "b" apply to community water systems and nontransient noncommunity water systems as specified herein. The three referenced organic chemical classes are volatile organic chemicals (VOCs), synthetic organic chemicals (SOCs), and trihalomethanes. The requirements also contain monitoring requirements, best available technology (BAT) identification, and analytical method requirements referenced in 41.5(1) "c," "d," and "f," respectively.

a. Applicability. The maximum contaminant levels for volatile and synthetic organic contaminants apply to community and nontransient noncommunity water systems. Compliance with the volatile and synthetic organic contaminant maximum contaminant level is calculated pursuant to 41.5(1) "b." The maximum contaminant level of 0.10 mg/L for total trihalomethanes (the sum of the concentrations of bromodichloromethane, tribromomethane (bromoform), dibromochloromethane, and trichloromethane (chloroform)) applies to all surface water community public water systems (CWS) serving 10,000 or more persons and all IGW CWS serving 10,000 or more persons until December 31, 2001, after which time the systems must comply with 41.6(455B). This 0.10 mg/L MCL also applies to all groundwater CWS serving 10,000 or more persons until December 31, 2003, after which time the systems must comply with 41.6(455B). Compliance with the maximum contaminant level for total trihalomethanes is calculated pursuant to 41.5(1) "e"(4).

b. Maximum contaminant levels (MCLs) and analytical methodology for organic compounds.
The maximum contaminant levels for organic chemicals are listed in the following table. Analyses for the contaminants in this subrule shall be conducted using the following methods, or their equivalent as approved by EPA.

(1) Table:

**ORGANIC CHEMICAL CONTAMINANTS, CODES, MCLs, ANALYTICAL METHODS,
AND DETECTION LIMITS**

Contaminant	EPA Contaminant Code	MCL (mg/L)	Methodology ¹	Detection Limit (mg/L)
Volatile Organic Chemicals (VOCs):				
Benzene	2990	0.005	502.2, 524.2	0.0005
Carbon tetrachloride	2982	0.005	502.2, 524.2, 551.1	0.0005
Chlorobenzene (mono)	2989	0.1	502.2, 524.2	0.0005
1,2-Dichlorobenzene (ortho)	2968	0.6	502.2, 524.2	0.0005
1,4-Dichlorobenzene (para)	2969	0.075	502.2, 524.2	0.0005
1,2-Dichloroethane	2980	0.005	502.2, 524.2	0.0005
1,1-Dichloroethylene	2977	0.007	502.2, 524.2	0.0005
cis-1,2-Dichloroethylene	2380	0.07	502.2, 524.2	0.0005
trans-1,2-Dichloroethylene	2979	0.1	502.2, 524.2	0.0005
Dichloromethane	2964	0.005	502.2, 524.2	0.0005
1,2-Dichloropropane	2983*	0.005	502.2, 524.2	0.0005
Ethylbenzene	2992	0.7	502.2, 524.2	0.0005
Styrene	2996	0.1	502.2, 524.2	0.0005
Tetrachloroethylene	2987	0.005	502.2, 524.2, 551.1	0.0005
Toluene	2991	1	502.2, 524.2	0.0005
1,1,1-Trichloroethane	2981	0.2	502.2, 524.2, 551.1	0.0005
Trichloroethylene	2984	0.005	502.2, 524.2, 551.1	0.0005
1,2,4-Trichlorobenzene	2378	0.07	502.2, 524.2	0.0005
1,1,2-Trichloroethane	2985	0.005	502.2, 524.2, 551.1	0.0005
Vinyl chloride	2976	0.002	502.2, 524.2	0.0005
Xylenes (total)	2955*	10	502.2, 524.2	0.0005
Synthetic Organic Chemicals (SOCs):				
Alachlor ³	2051	0.002	505, 507, 508.1, 525.2, 551.1	0.0002
Aldicarb	2047	0.003	531.1, 6610	0.0005
Aldicarb sulfone	2044	0.002	531.1, 6610	0.0008
Aldicarb sulfoxide	2043	0.004	531.1, 6610	0.0005
Atrazine ³	2050	0.003	505, 507, 508.1, 525.2, 551.1	0.0001
Benzo(a)pyrene	2306	0.0002	525.2, 550, 550.1	0.00002
Carbofuran	2046	0.04	531.1, 6610	0.0009
Chlordane ³	2959	0.002	505, 508, 508.1, 525.2	0.0002
2,4-D ⁶ (as acids, salts, or esters)	2105	0.07	515.1, 515.2, 515.3, 555, D5317-93	0.0001
Dalapon	2031	0.2	515.1, 515.3, 552.1, 552.2	0.001

Contaminant	EPA Contaminant Code	MCL (mg/L)	Methodology ¹	Detection Limit (mg/L)
1,2-Dibromo-3-chloropropane (DBCP)	2931	0.0002	504.1, 551.1	0.00002
Di(2-ethylhexyl)adipate	2035	0.4	506, 525.2	0.0006
Di(2-ethylhexyl)phthalate	2039	0.006	506, 525.2	0.0006
Dinoseb ⁶	2041	0.007	515.1, 515.2, 515.3, 555	0.0002
Diquat	2032	0.02	549.2	0.0004
Endothall	2033	0.1	548.1	0.009
Endrin ³	2005	0.002	505, 508, 508.1, 525.2, 551.1	0.00001
Ethylene dibromide (EDB)	2946	0.00005	504.1, 551.1	0.00001
Glyphosate	2034	0.7	547, 6651	0.006
Heptachlor ³	2065	0.0004	505, 508, 508.1, 525.2, 551.1	0.00004
Heptachlor epoxide ³	2067	0.0002	505, 508, 508.1, 525.2, 551.1	0.00002
Hexachlorobenzene ³	2274	0.001	505, 508, 508.1, 525.2, 551.1	0.0001
Hexachlorocyclopentadiene ³	2042	0.05	505, 508, 508.1, 525.2, 551.1	0.0001
Lindane (gamma BHC) ³	2010	0.0002	505, 508, 508.1, 525.2, 551.1	0.00002
Methoxychlor ³	2015	0.04	505, 508, 508.1, 525.2, 551.1	0.0001
Oxamyl	2036	0.2	531.1, 6610	0.002
Pentachlorophenol	2326	0.001	515.1, 515.2, 515.3, 525.2, 555, D5317-93	0.00004
Picloram ^{3,6}	2040	0.5	515.1, 515.2, 515.3, 555, D5317-93	0.0001
Polychlorinated biphenyls ⁴ (as decachlorobiphenyl) (as Aroclors) ³	2383	0.0005	508A 505, 508, 508.1, 525.2	0.0001
Simazine ³	2037	0.004	505, 507, 508.1, 525.2, 551.1	0.00007
2,3,7,8-TCDD (dioxin)	2063	3x10 ⁻⁸	1613	5x10 ⁻⁹
2,4,5-TP ⁶ (Silvex)	2110	0.05	515.1, 515.2, 515.3, 555, D5317-93	0.0002
Toxaphene ³	2020	0.003	505, 508, 508.1, 525.2	0.001
Total Trihalomethanes (TTHMs) ⁵ :				
Total Trihalomethanes (the sum of the concentrations of bromodichloromethane, dibromochloromethane, tribromomethane (bromoform), and trichloromethane (chloroform))	2950	0.10	502.2, 524.2, 551.1	

*As of January 1, 1999, the contaminant codes for the following compounds were changed from the Iowa Contaminant Code to the EPA Contaminant Code:

Contaminant	Iowa Contaminant Code (Old)	EPA Contaminant Code (New)
1,2 Dichloropropane	2325	2983
Xylenes (total)	2974	2955

¹ Analyses for the contaminants in this section shall be conducted using the following EPA methods or their equivalent as approved by EPA. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51, effective January 4, 1995. Copies may be inspected at EPA's Drinking Water Docket, 401 M Street SW, Washington, DC 20460; or at the Office of the Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC.

The following methods are available from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161 (telephone: (800)553-6847).

Methods for the Determination of Organic Compounds in Drinking Water, EPA-600/4-88-039, December 1988, Revised July 1991 (NTIS PB91-231480); Methods 508A and 515.1.

Methods for the Determination of Organic Compounds in Drinking Water—Supplement I, EPA-600/4-90-020, July 1990 (NTIS PB91-146027); Methods 547, 550, 550.1.

Methods for the Determination of Organic Compounds in Drinking Water—Supplement II, EPA-600/R-92-129, August 1992 (NTIS PB92-207703); Methods 548.1, 552.1, 555.

Methods for the Determination of Organic Compounds in Drinking Water—Supplement III, EPA-600/R-95-131, August 1995 (NTIS PB95-261616); Methods 502.2, 504.1, 505, 506, 507, 508, 508.1, 515.2, 524.2, 525.2, 531.1, 551.1, 552.2.

Method 1613 "Tetra-through Octa-Chlorinated Dioxins and Furans by Isotope-Dilution HRGC/HRMS," EPA-821-B-94-005, October 1994 (NTIS PB95-104774).

The following American Public Health Association (APHA) documents are available from APHA, 1015 Fifteenth Street NW, Washington, DC 20005.

Supplement to the 18th edition of Standard Methods for the Examination of Water and Wastewater, 1994, or Standard Methods for the Examination of Water and Wastewater, 19th edition, 1995 (either publication may be used), APHA: Method 6610.

Standard Methods for the Examination of Water and Wastewater, 18th edition, 1992, and 19th edition, 1995 (either edition may be used), APHA: Method 6651.

The following American Society for Testing and Materials (ASTM) method is available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

Annual book of ASTM Standards, 1996, Vol. 11.02 (or any edition published after 1993), ASTM: D5317-93.

Methods 515.3 and 549.2 are available from U.S. EPA NERL, 26 W. Martin Luther King Drive, Cincinnati, OH 45268.

Other required analytical test procedures germane to the conduct of these analyses are contained in Technical Notes on Drinking Water Methods, EPA-600/R-94-173, October 1994 (NTIS PB95-104766).

² Reserved.

³ Substitution of the detector specified in Method 505, 507, 508, or 508.1 for the purpose of achieving lower detection limits is allowed as follows. Either an electron capture or nitrogen-phosphorus detector may be used provided all regulatory requirements and quality control criteria are met.

⁴ PCBs are qualitatively identified as Aroclors and measured for compliance purposes as decachlorobiphenyl. Users of Method 505 may have more difficulty in achieving the required detection limits than users of Method 508. 508.1, or 525.2.

⁵ The TTHM MCL for surface water or influenced groundwater CWS and NTNC systems serving over 10,000 persons will be changed to 0.080 mg/L on January 1, 2002. All remaining CWS and NTNC will be required to comply with the 0.080 mg/L MCL on January 1, 2004. See rule 41.6(455B) for additional requirements.

⁶ Accurate determination of the chlorinated esters requires hydrolysis of the sample as described in EPA Methods 515.1, 515.2, 515.3, and 555, and ASTM Method D5317-93.

(2) Organic chemical compliance calculations (other than total trihalomethanes). Compliance with 41.5(1) "b"(1) shall be determined based on the analytical results obtained at each sampling point.

1. For systems which are conducting monitoring at a frequency greater than annual, compliance is determined by a running annual average of all samples taken at each sampling point. If the annual average of any sampling point is greater than the MCL, then the system is out of compliance. If the initial sample or a subsequent sample causes the annual average to be exceeded, then the system is out of compliance immediately. Any samples below the detection limit shall be calculated as zero for purposes of determining the annual average.